

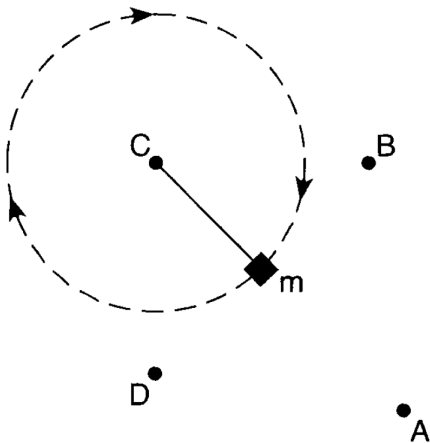
1. What is the magnitude of the electrostatic force between two electrons separated by a distance of 1.00×10^{-8} meter?

A) 2.30×10^{-20} N B) 2.56×10^{-22} N
C) 2.30×10^{-12} N D) 1.44×10^{-1} N

2. A motorboat, which has a speed of 5.0 meters per second in still water, is headed east as it crosses a river flowing south at 3.3 meters per second. What is the magnitude of the boat's resultant velocity with respect to the starting point?

A) 5.0 m/s B) 6.0 m/s
C) 3.3 m/s D) 8.3 m/s

3. The diagram below represents a mass, m , being swung clockwise at constant speed in a horizontal circle.



At the instant shown, the centripetal force acting on mass m is directed toward point

A) A B) B C) C D) D

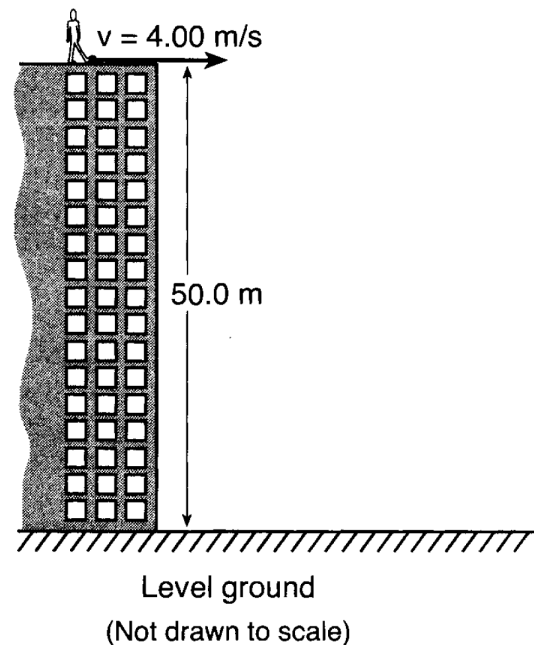
4. A ball is thrown vertically upward with an initial velocity of 29.4 meters per second. What is the maximum height reached by the ball? [Neglect friction.]

A) 14.7 m B) 29.4 m
C) 44.1 m D) 88.1 m

5. Which body is in equilibrium?

A) a satellite moving around Earth in a circular orbit
B) an apple falling freely toward the surface of Earth
C) a cart rolling down a frictionless incline
D) a block sliding at constant velocity across a tabletop

6. As shown in the diagram below, a student standing on the roof of a 50.0-meter-high building kicks a stone at a horizontal speed of 4.00 meters per second.



How much time is required for the stone to reach the level ground below? [Neglect friction.]

A) 10.2 s B) 12.5 s
C) 5.10 s D) 3.19 s

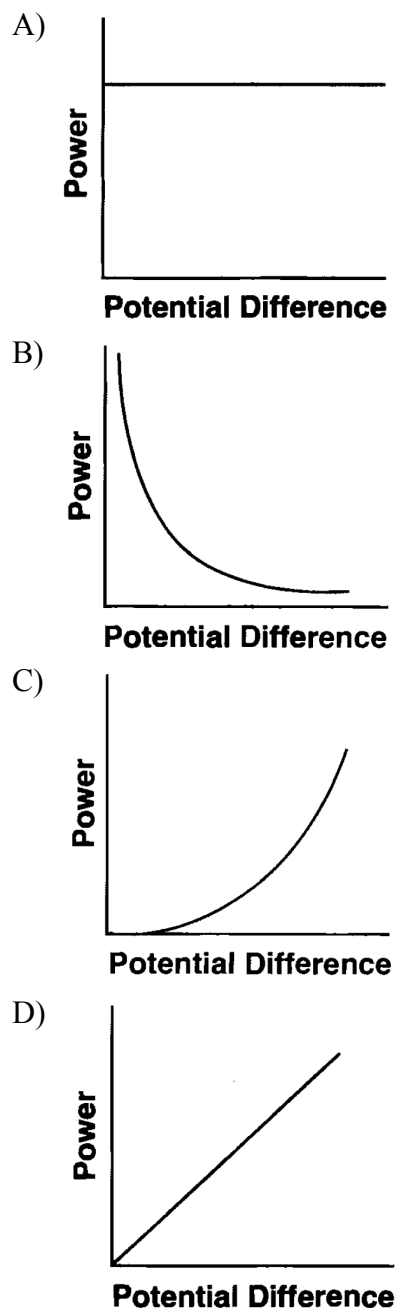
7. A small electric motor is used to lift a 0.50-kilogram mass at constant speed. If the mass is lifted a vertical distance of 1.5 meters in 5.0 seconds, the average power developed by the motor is

A) 1.5 W B) 0.15 W
C) 3.8 W D) 7.5 W

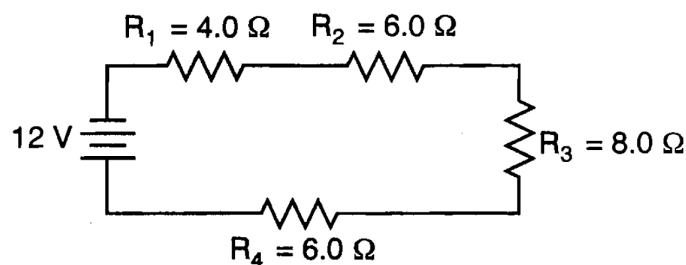
8. A 75-kilogram bicyclist coasts down a hill at a constant speed of 12 meters per second. What is the kinetic energy of the bicyclist?

A) 1.1×10^4 J B) 5.4×10^3 J
C) 9.0×10^2 J D) 4.5×10^2 J

9. Which graph best represents the relationship between the power expended by a resistor that obeys Ohm's Law and the potential difference applied to the resistor?



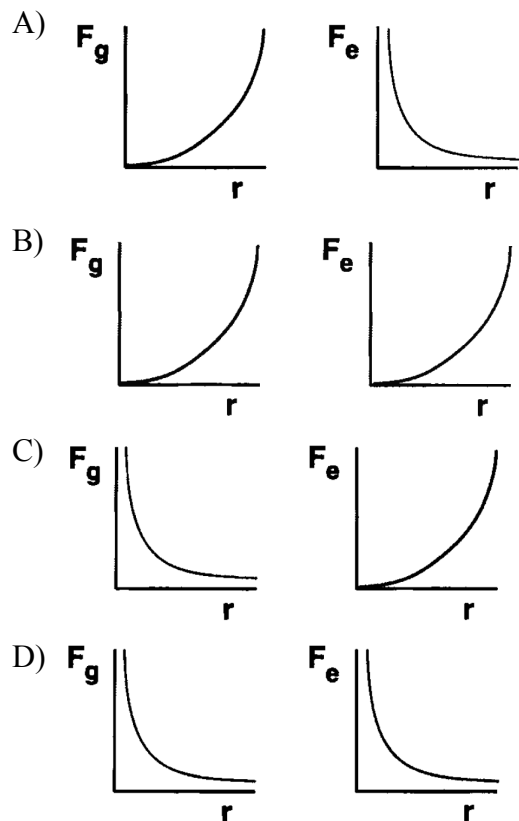
10. The circuit diagram below represents four resistors connected to a 12-volt source.



What is the total current in the circuit?

- A) 24 A B) 0.50 A
C) 2.0 A D) 8.6 A
11. Which electrical unit is equivalent to one joule?
- A) volt per coulomb B) coulomb•volt
C) ampere•volt D) volt per meter
12. A charge of 30. coulombs passes through a 24-ohm resistor in 6.0 seconds. What is the current through the resistor?
- A) 4.0 A B) 7.5 A C) 5.0 A D) 1.3 A
13. A 15.0-kilogram mass is moving at 7.50 meters per second on a horizontal, frictionless surface. What is the total work that must be done on the mass to increase its speed to 11.5 meters per second?
- A) 422 J B) 992 J
C) 120. J D) 570. J
14. An electric heater operating at 120. volts draws 8.00 amperes of current through its 15.0 ohms of resistance. The total amount of heat energy produced by the heater in 60.0 seconds is
- A) 6.91×10^6 J B) 5.76×10^4 J
C) 7.20×10^3 J D) 8.64×10^4 J

15. The distance between an electron and a proton is varied. Which pair of graphs best represents the relationship between gravitational force, F_g , and distance, r , and the relationship between electrostatic force, F_e , and distance, r , for these particles?



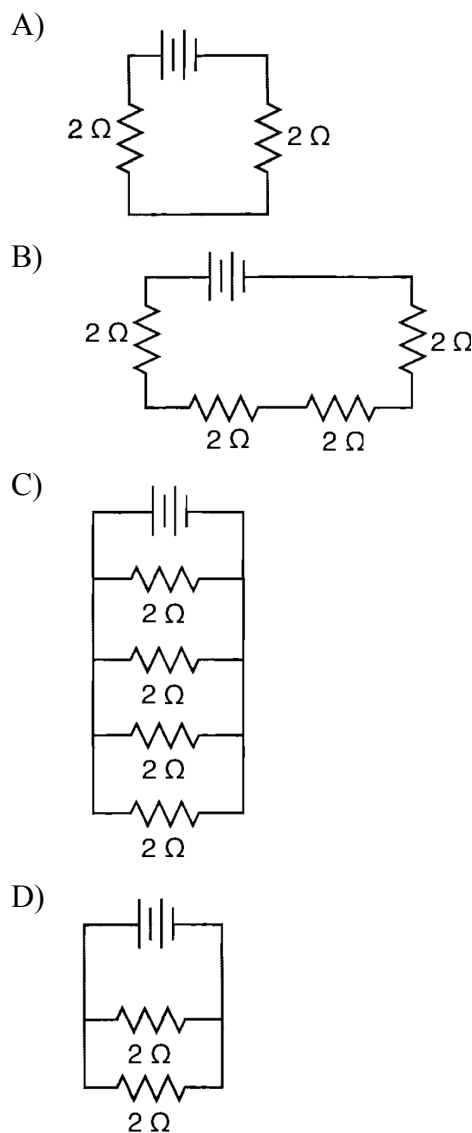
16. A 0.149-kilogram baseball, initially moving at 15 meters per second, is brought to rest in 0.040 second by a baseball glove on a catcher's hand. The magnitude of the average force exerted on the ball by the glove is

A) 17 N B) 2.2 N C) 2.9 N D) 56 N

17. A car traveling on a straight road at 15.0 meters per second accelerates uniformly to a speed of 21.0 meters per second in 12.0 seconds. The total distance traveled by the car in this 12.0-second time interval is

A) 252 m B) 216 m
C) 180. m D) 36.0 m

18. Which circuit has the *smallest* equivalent resistance?



19. The data table below lists the mass and speed of four different objects.

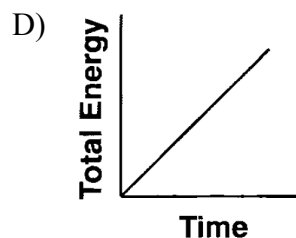
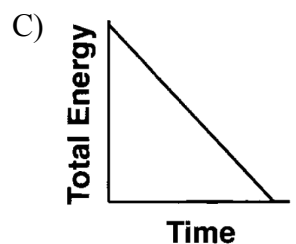
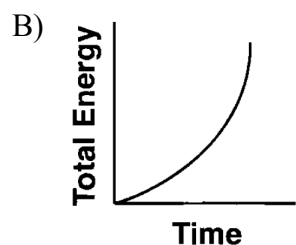
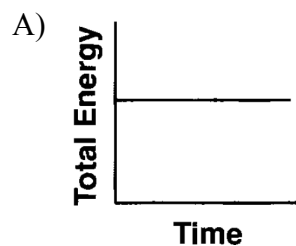
Data Table

Object	Mass (kg)	Speed (m/s)
A	4.0	6.0
B	6.0	5.0
C	8.0	3.0
D	16.0	1.5

Which object has the greatest inertia?

A) A B) B C) C D) D

20. A ball is dropped from the top of a cliff. Which graph best represents the relationship between the ball's total energy and elapsed time as the ball falls to the ground? [Neglect friction.]



21. The total work done in lifting a typical high school physics textbook a vertical distance of 0.10 meter is approximately

- A) 0.15 J B) 1.5 J
C) 15 J D) 150 J

22. A 5.0-kilogram sphere, starting from rest, falls freely 22 meters in 3.0 seconds near the surface of a planet. Compared to the acceleration due to gravity near Earth's surface, the acceleration due to gravity near the surface of the planet is approximately

- A) four times as great B) one-half as great
C) twice as great D) the same
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23. Four projectiles, *A*, *B*, *C*, and *D*, were launched from, and returned to, level ground. The data table below show the initial horizontal speed, initial vertical speed, and time of flight for each projectile.

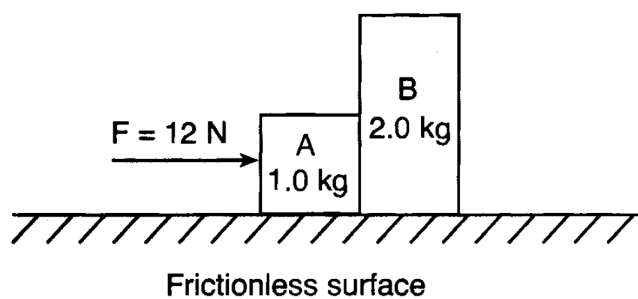
Data Table

Projectile	Initial Horizontal Speed (m/s)	Initial Vertical Speed (m/s)	Time of Flight (s)
A	40.0	29.4	6.00
B	60.0	19.6	4.00
C	50.0	24.5	5.00
D	80.0	19.6	4.00

Which projectile traveled the greatest horizontal distance? [Neglect friction.]

- A) *A* B) *B* C) *C* D) *D*

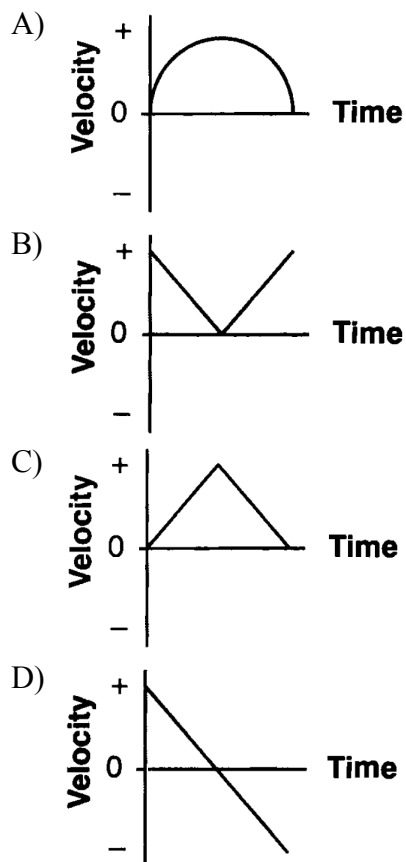
24. The diagram below shows a horizontal 12-newton force being applied to two blocks, *A* and *B*, initially at rest on a horizontal, frictionless surface. Block *A* has a mass of 1.0 kilogram and block *B* has a mass of 2.0 kilograms.



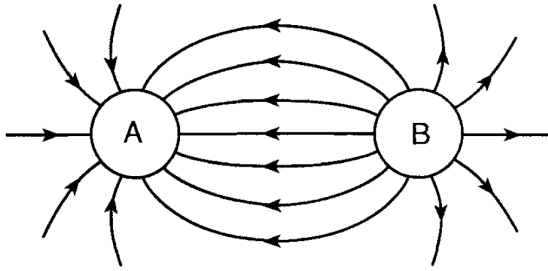
The magnitude of the acceleration of block *B* is

- A) 3.0 m/s^2 B) 6.0 m/s^2
 C) 4.0 m/s^2 D) 2.0 m/s^2

25. A student throws a baseball vertically upward and then catches it. If vertically upward is considered to be the positive direction, which graph best represents the relationship between velocity and time for the baseball? [Neglect friction.]



26. The diagram below represents the electric field surrounding two charged spheres. *A* and *B*.



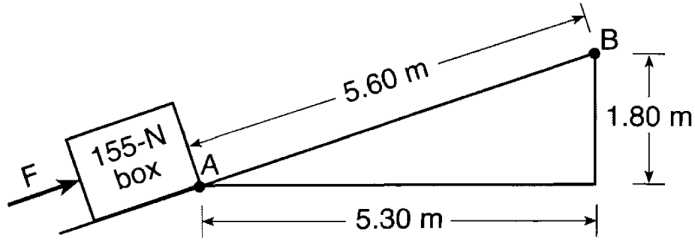
What is the sign of the charge of each sphere?

- A) Both spheres are negative
B) Sphere *A* is negative and sphere *B* is positive.
C) Sphere *A* is positive and sphere *B* is negative.
D) Both spheres are positive.
27. A student pulls a 60.-newton sled with a force having a magnitude of 20. newtons. What is the magnitude of the force that the sled exerts on the student?
A) 60. N B) 40. N C) 20. N D) 80. N
28. A baseball player runs 27.4 meters from the batter's box to first base, overruns first base by 3.0 meters, and then returns to first base. Compared to the total distance traveled by the player, the magnitude of the player's total displacement from the batter's box is
A) 6.0 m longer B) 6.0 m shorter
C) 3.0 m shorter D) 3.0 m longer
29. A child, starting from rest at the top of a playground slide, reaches a speed of 7.0 meters per second at the bottom of the slide. What is the vertical height of the slide? [Neglect friction.]
A) 1.4 m B) 3.5 m
C) 2.5 m D) 0.71 m
30. On the surface of Earth, a spacecraft has a mass of 2.00×10^4 kilograms. What is the mass of the spacecraft at a distance of one Earth radius above Earth's surface?
A) 5.00×10^3 kg B) 2.00×10^4 kg
C) 1.96×10^5 kg D) 4.90×10^4 kg

31. A 3.1 kilogram gun initially at rest is free to move. When a 0.015-kilogram bullet leaves the gun with a speed of 500. meters per second, what is the speed of the gun?

- A) 0.0 m/s B) 500. m/s
C) 7.5 m/s D) 2.4 m/s

32. The diagram below represents a 155-newton box on a ramp. Applied force F causes the box to slide from point A to point B .



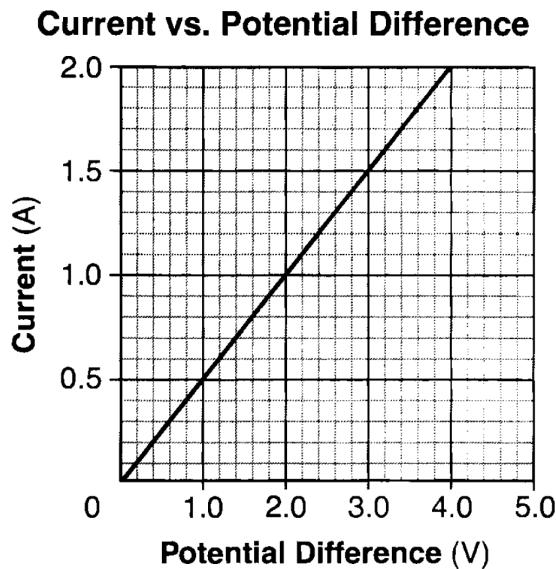
What is the total amount of gravitational potential energy gained by the box?

- A) 279 J B) 28.4 J C) 2740 J D) 868 J

33. Magnetic fields are produced by particles that are

- A) moving and neutral
B) stationary and charged
C) stationary and neutral
D) moving and charged

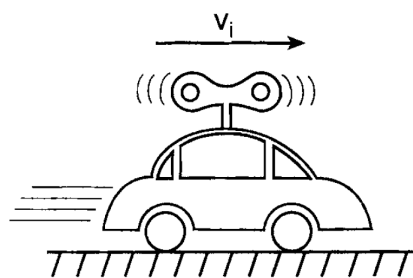
34. The graph below represents the relationship between the current in a metallic conductor and the potential difference across the conductor at constant temperature.



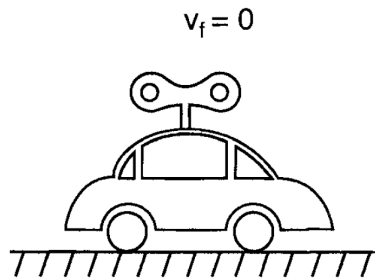
The resistance of the conductor is

- A) 4.0 Ψ B) 1.0 Ψ
C) 2.0 Ψ D) 0.50 Ψ

35. A wound spring provides the energy to propel a toy car across a level floor. At time t_i , the car is moving at speed v_i across the floor and the spring is unwinding, as shown below. At time t_f , the spring has fully unwound and the car has coasted to a stop.



At time t_i



At time t_f

Which statement best describes the transformation of energy that occurs between the t_i and t_f ?

- A) Gravitational potential energy at t_i is converted to internal energy at t_f .
- B) Both elastic potential energy and kinetic energy at t_i are converted to internal energy at t_f .
- C) Elastic potential energy at t_i is converted to kinetic energy at t_f .
- D) Both kinetic energy and internal energy at t_i are converted to elastic potential energy at t_f .